

MIDTRIASSIC NEW GENERA AND SPECIES OF ORTHOPHLEBIIDAE AND NEORTHOPHLEBIIDAE (INSECTA, MECOPTERA) FROM SHAANXI, CHINA

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Abstract In this paper, *Protorthophlebia* (*Psomophlebia*), *Orthophlebia* (*Orthophlebia*) and *Ctenophlebia tongchuanensis* sp. nov. are described, based on the specimens collected from the grayish green mudstone and shale of Upper part, Lower Member of Midtriassic Tongchuan Formation (Tr_{2t}), Shaanxi Province, China. The new genera and species are unique and are assigned to new members of the Tongchuan Entomoassemblage of Shaanxi Entomofauna. All specimens are deposited in the Beijing Museum of Natural History.

Key words *Protorthophlebia*, *Orthophlebia*, new genus, Midtriassic, Tongchuan Formation (Tr₂), China.

Taxonomic descriptions

Insecta Linne, 1758

Mecoptera Packard, 1886

Eumecoptera Tillyard, 1933

1 Orthophlebiidae Handlisch, 1906

Protorthophlebia Tillyard, 1933

Protorthophlebia (*Psomophlebia*) Hong et Zhang, 2004

Protorthophlebia (*Psomophlebia*) *aurta* sp. nov.
(Figs 1-2)

Holotype: 82TH1-1/T122.

Etymology. From Latin *aurta*-short, referring short stem of Rs (shorter than MA).

Material. A forewing specimen, except anal area damaged, other part of the wing is preserved well, venation distinct.

Description. Front margin (or costal, anterior margin) of the forewing stretched upwards obliquely and straightly, then arched near wing apex; Sc unbranched, straight, parallel to anterior margin, ending extended to Pt region; R runs upwards obliquely and parallel to Sc, its termination forked; its posterior boundary demarcated by a sharp line; Rs+ MA arised moderately from R, then Rs separating from MA before midwing, Rs and MA branched respectively and dichotomously, ARs 2-branched, PRs single; MA 2-branched; stem of Rs forked earlier than that of MA, i. e. stem of Rs shorter than that of MA, so it should be referred to this subgenus; stem of MP very long and forked into anterior (AMP) and posterior (PMP) branches; the former with 2 branches, the latter with 3 branches; stem of MP coalesced with CuA and formed a very short merged vein - MP+ CuA; CuA obliquely straight, then merged with R and formed a merged vein R+ M+ CuA, this is very

particular feature for this species; anal area preserved incompletely; Pt indistinct.

Comparison. *P.* (*Psomophlebia*) *aurta* sp. nov. is similar to *P.* (*Psomophlebia*) *bifasciata* Riek, 1950, but differs in Sc single; stem of MP connecting basally to CuA and formed a short merged vein MP+ CuA, then merged with R and formed a merged vein R+ M+ CuA, stem of MP very long and forked into anterior (AMP) and posterior (PMP) branches; the former with 2 branches, the latter with 3 branches; stem of MP+ CuA very short.

Measurements. Forewing, specimen (holotype) 10.5 mm long, 4.2 mm wide.

Locality and Horizon. The specimen is collected from the mudstone and shale of upper part of Lower Member, Middle Triassic Tongchuan Formation (Tr_{2t}), Tongchuan Region of Shaanxi Province, China.

Orthophlebia Westwood, 1845

Orthophlebia (*Dolichophlebia*) Hong et Zhang, 2004

Orthophlebia (*Dolichophlebia*) *ladinica* sp. nov.
(Figs. 3-4)

Specimen (holotype): TH001/010.

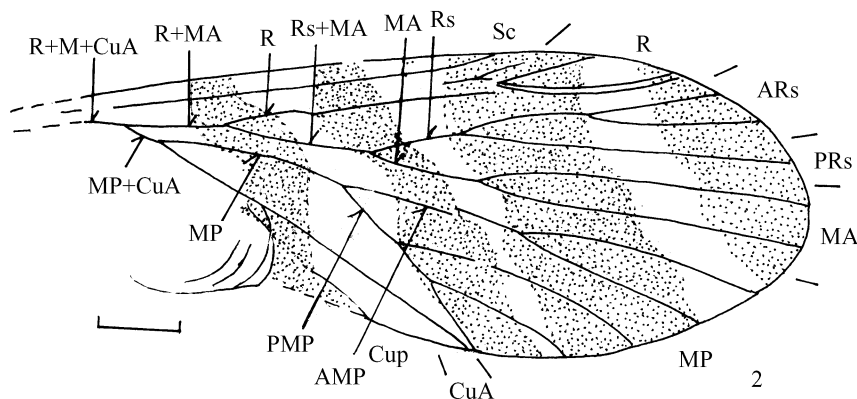
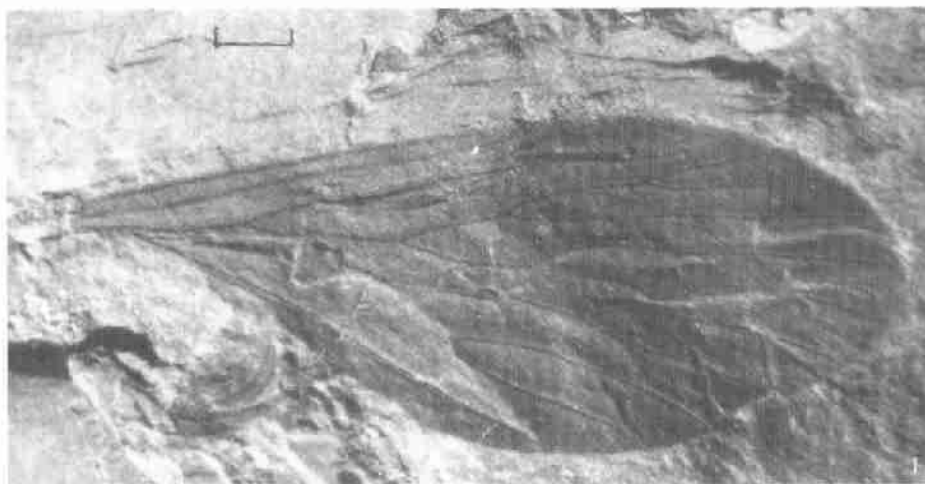
Etymology. From Greek Ladinian a geological stage of Middle Triassic epoch.

Material. This specimen is possibly a hind wing, its base damaged, only remained median posterior part of the wing, but its venation distinct.

Description. Costal margin incomplete; Sc single, closed to costal margin and extended about to midwing; R single, straight, stretched obliquely upwards; Rs parallel to R, ARs (= Rs₁) with 3 branches, PRs single; MA forked into two branches and branched earlier than that of Rs, so stem of Rs longer than that of MA; stem of MP with 4 simple branches, anterior branch

(AMP) forked later than that of posterior branch (PMA); stem of AMP; MP remote with stem of MA, so formed a wide space between the MP and MA; CuA, CuP and 3 anal veins: A_1 - A_3 , preserved incompletely;

wing surface with some deep and shallow brown colour; especially deep brown colour rounded the wing termination.



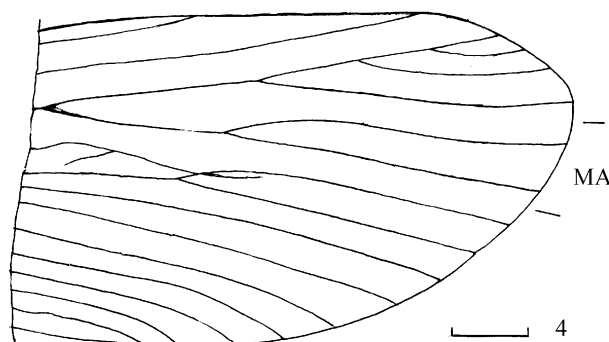
Figs 1-2. *Protorthophlebia* (*Psanophlebia*) *arta* sp. nov. Holotype: 82TH₁ / T122. 1. Fossil photo of forewing, 10.38 × . 2. Venational characters. Sc Subcosta, R Radius, Rs Radiosector, RsA, RsP anterior (ARs) and posterior (PRs) branches of Radiosector, MA, MP anterior (AMP) and posterior (PMP) branches of Media. CuA, CuP anterior (CuA) and posterior (CuP) branches of Cubitus; Rs+ MA merged vein of Radiosector and anterior branch of Media, R+ MA merged vein of Radius and anterior branch of Media; R+ M+ CuA merged vein of Radius, Media and anterior branch of Cubitus

Comparison. According to ARs (= Rs₁) with 3 branches and stem of Rs longer than that of MA of this species, it should be referred to the genus *Orthophlebia* (*Dolichophlebia*) Hong *et* Zhang, 2004. Up to now this subgenus includes known at least 50 species and distributed widely in various region of the world, especially in Northern hemisphere. The new species are characterized by Sc closed to costal margin and extended about to midwing; stem of Rs and MA forked about at same level; MP-MA area very wide. Thus it can be distinguished from other species with in this subgenus.

Other species within *Orthophlebia* (*Dolichophlebia*). Up to now the discovery of species of *Orthophlebia* Westwood, 1845 from Middle Triassic Tongchuan Formation (Tr_{2t}) is the oldest species and has a certain reference value for the primary venational character of this genus.

Measurements. Preserved length of wing > 8 mm, width 5 mm.

Locality and Horizon. Ditto *P. P. arta* sp. nov.



Figs 3-4. *Orthophlebia* (*Dolichophlebia*) *ladinica* sp. nov. Holotype: TH00 1/010. 3. Fossil photo of hindwing, 12 \times . 4. Venational characters.

2 Neorthophlebiidae Handlirsch, 1925

Ctenophlebia gen. nov.

Type species: *Ctenobittacus tongchuanensis* sp. nov.; Tongchuan Region of Shaanxi, China (Tr₂).

Etymology. Consisting of Greek Cten comb-like and phleb- vein.

Diagnosis. Forewing long and narrow; wing base and apex sharp-like; Sc extended before midwing, and with a twig, fusing with R; Rs+ MA and MP each with 4 branches; the branches of Rs+ MA and MP arranging respectively in comb-like, this is a very important feature for this genus; MP coalesced with CuA basally.

Distribution. Middle Triassic (Tr₂), Tongchuan Region of Shaanxi Province, China.

Comparison. According to Rs+ MA and MP each with 4 branches, forewing narrow and long; terminal branches of Rs+ MA and MP straight, MP coalesced with CuA basally, the new genus can be distinguished from other species within Neorthophlebiidae.

The new genus is similar to *Neorthophlebia* Handlirsch, 1906, *Neorthophleboopsis* Hong, Guo et Li, (2005), but can be distinguished from them in Sc forked, CuA not branched, especially all branched of Rs+ MA

and MP respectively arranged in comb-like; and from other genera within Neorthophlebiidae, because in the latter the Rs+ MA and MP forked dichotomously and the Sc unbranched. Above features of the new genus differs also from *Protobittacus* Tillyard, 1933, *Probittacus* Martynov, 1927 and *Palaeobittacus* Carpenter, 1928, especially in all branched of Rs+ MA and MP respectively arranged in comb-like.

Ctenophlebia tongchuanensis sp. nov. (Figs. 5-7)

Holotype, TH99-1/1044-1, -2.

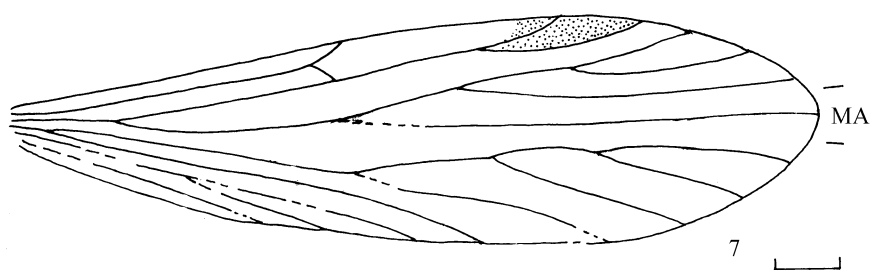
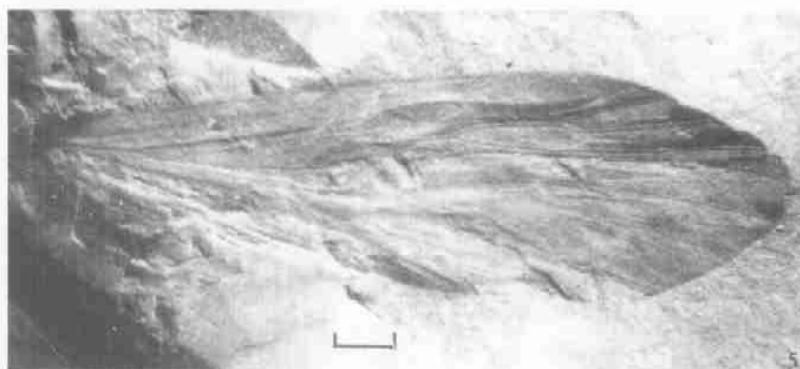
Etymology. From Tongchuan Region fossil locality.

Materials. Two overlapping forewings, but the venicles well preserved, counterpart; anal and anal veins preserved incompletely.

Description. Forewing long and narrow; wing apex and extended before midwing, its termination with a twig, which downwards fused with R; R curved, especially before pterostigmal region, Rs+ MA with 4 branches; stem Rs+ MA curved slight, then stretched upwards slight, then stretched upwards and Rs separated from MA almost as same level with Sc ending; Rs with 2 branches; MA with 2 branches too. terminal branches straight and occupied the wing apex; MP fused with CuA

basally, merged vein MP+ CuA short, stem MP long, forked later in a little than Rs+ MA, with 4 branches; MP₁-MP₄, remonte with the MP₃, CuA straight runs downwards; CuP closed parallel almost each other; anal

area with 2 branches, A₁ fused with CuP; Pt large; wing surface seems with 3 (or 4 ?) brown colour bands (see forewing counterpart TH99-1/1044-1, 2).



Figs 5-7. *Orthophlebia* (*Dolichophlebia*) *tongchuanensis* sp. nov. Holotype: TH99-1/1044-1, -2. (counterpart) 5. Fossil photos of forewing, 8.2x, TH99-1/1044-1. 6. Fossil photo of forewing, 11x, TH99-1/1044-2. 7. Venational characters.

Measurements. Forewing long 13 mm, wide 4 mm (TH99-1. 1044-1; in the specimen TH99-1/1044-2., the basic part missing; wing incompletely preserved.

Locality and Horizon. Ditto *P. P. curta* sp. nov.

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中国陕西中三叠世直脉蝎蛉科和新直脉蝎蛉科新属、种 (昆虫纲, 长翅目)

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摘要 记述直脉蝎蛉科两亚属的两新种和新直脉蝎蛉科1新属、种, 并讨论其分类位置。这些新属种是本区独特的地方性类群, 对地层划分与对比有一定的意义。化石标本采自陕西铜川中三叠统铜川组下段上部的灰绿色泥页岩。这些新

属种也是铜川昆虫组合的新成员, 属陕西昆虫群 (系陕西生物群的一个化石类别)。根据陕西生物群的特征, 其时代相当欧洲中三叠世拉丁期 (Ladinian Stage)。

关键词 原直脉蝎蛉属, 直脉蝎蛉属, 新属, 中三叠世, 铜川组 (Tr_3), 中国。

中图分类号 Q15. 819. 7